SESSION 1.3

CENTRAL PROCESSOR UNITS (CPU) AND VME SYSTEM

DAVE MILLER

CENTRAL PROCESSOR UNITS (CPU)

- **CPU is the "BRAINS" of the 2070 ATC**

- **Includes microprocessor, memory and mass storage**

- **Currently, two CPU versions, 2070-1A and 2070-1B**

- **2070-1A: Two board version with parallel expansion**

- **2070-1B: One board version with serial expansion**

- **Planned, 2070-1C: Processor and OS independent**

2070-1A & 2070-1B COMMON FEATURES

- **Memory Types and Capacities**
    - **4 Megabyte minimum FLASH drive**
    - **512 Kbytes minimum capacitor-backed SRAM**
    - **4 Megabytes minimum DRAM**

- **68360 Microprocessor, 24.576 MHz**

- **Time of day (TOD) clock, including day, date**

- **Super capacitor backup for TOD and SRAM, 10 days min when removed from controller, 30 days min when installed**

- **OS-9 operating system with 2070 extensions**

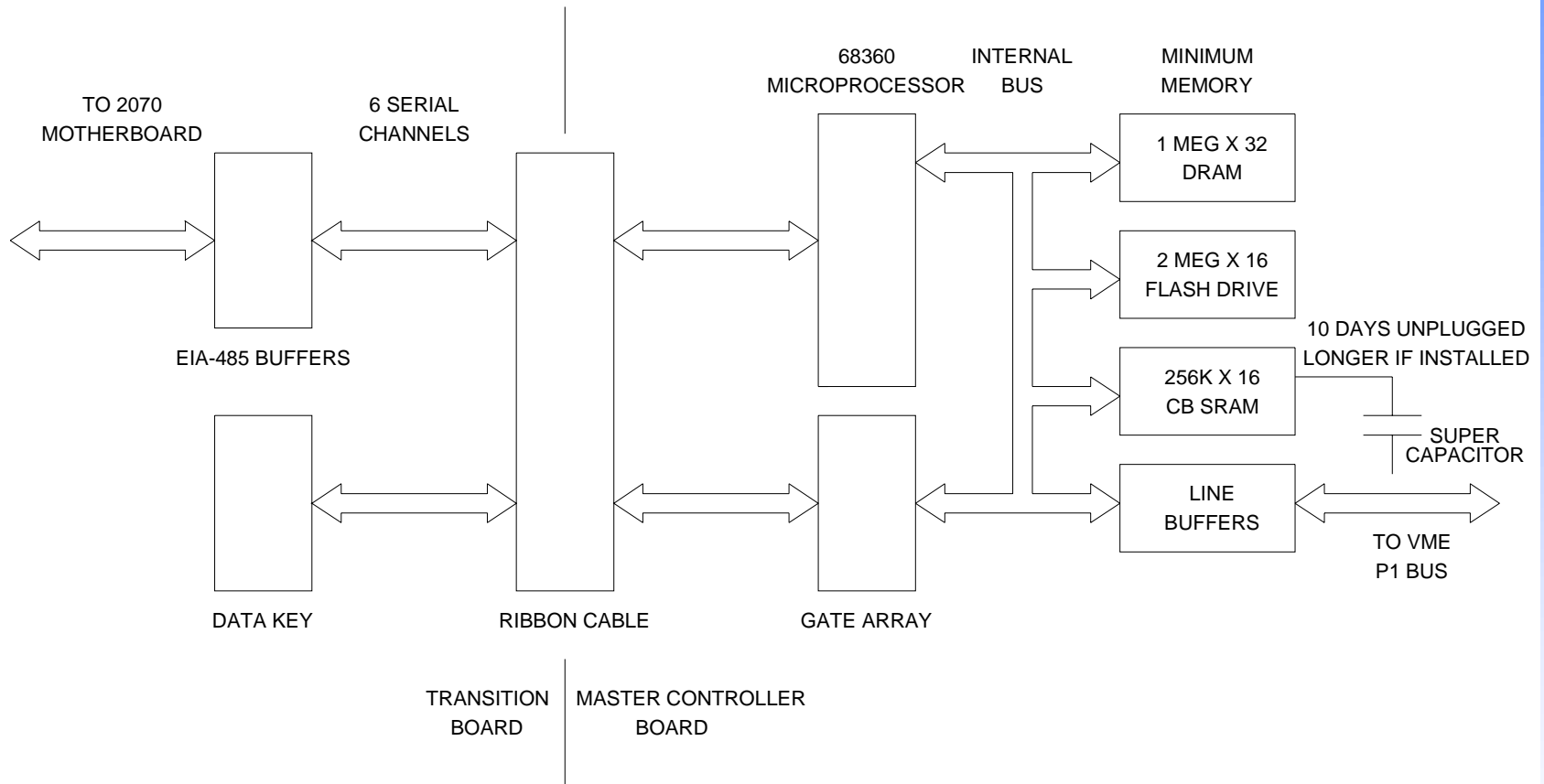- **Data_Key holder and removable data_key**

2070-1A TWO BOARD CPU

VME MCB

2070-1A CPU

TRANSITION BOARD

2070-1A CPU BLOCK DIAGRAM

2070-1A CPU VME EXPANSION

- **Expansion via parallel Versa Module Europe (VME) bus**

- **VME is a worldwide standard for hardened computers**

- **Used in military, petrochemical and robotic applications**

- **P1 8/16/32/64-bit multi-processor, bus request/grant**

- **3U half-height with 96 pin DIN connector**

- **2070-1A MCB occupies one slot, 4 spare expansion slots**

- **Hundreds of standard VME modules from multiple vendors (see www.vita.com for listing of vendors and products)**

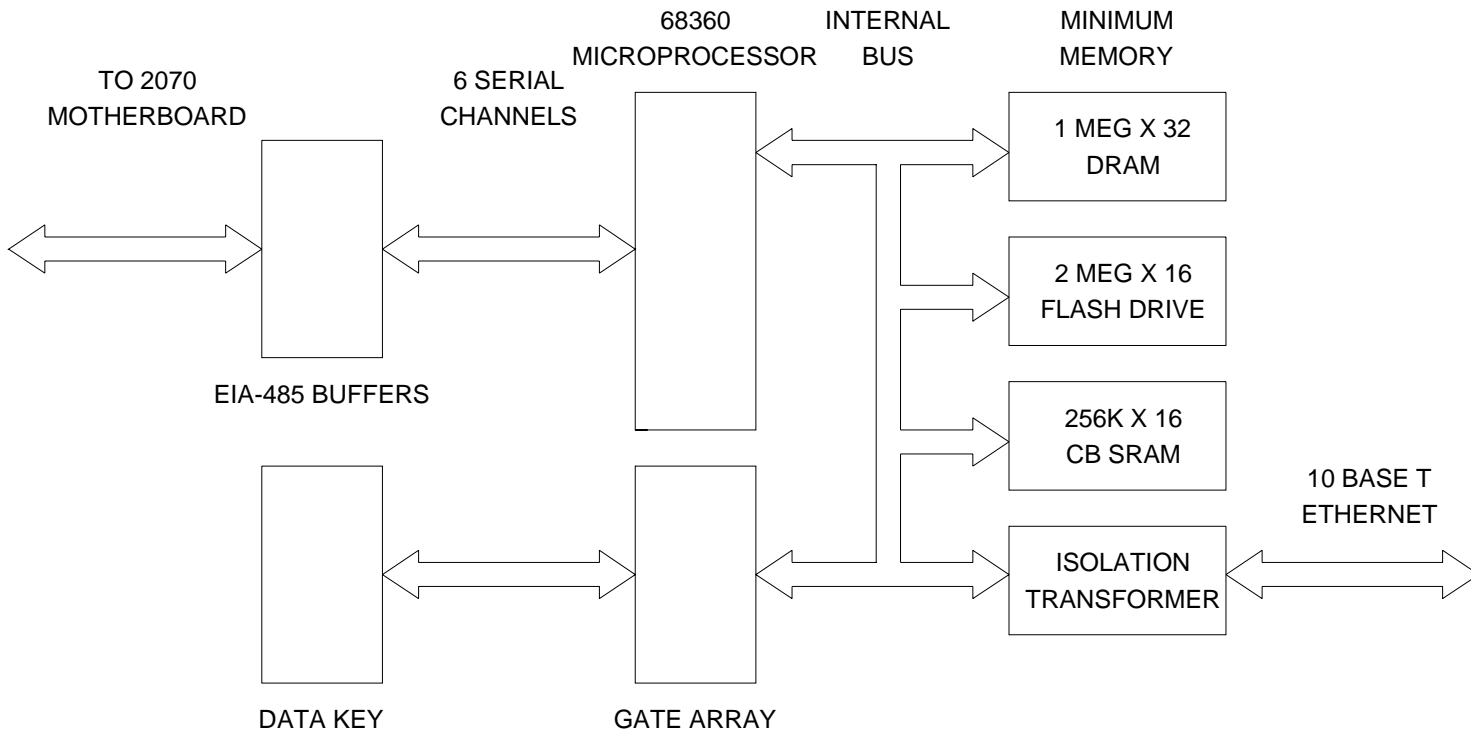# 2070-1A VME P1 BUS (96 PINS)
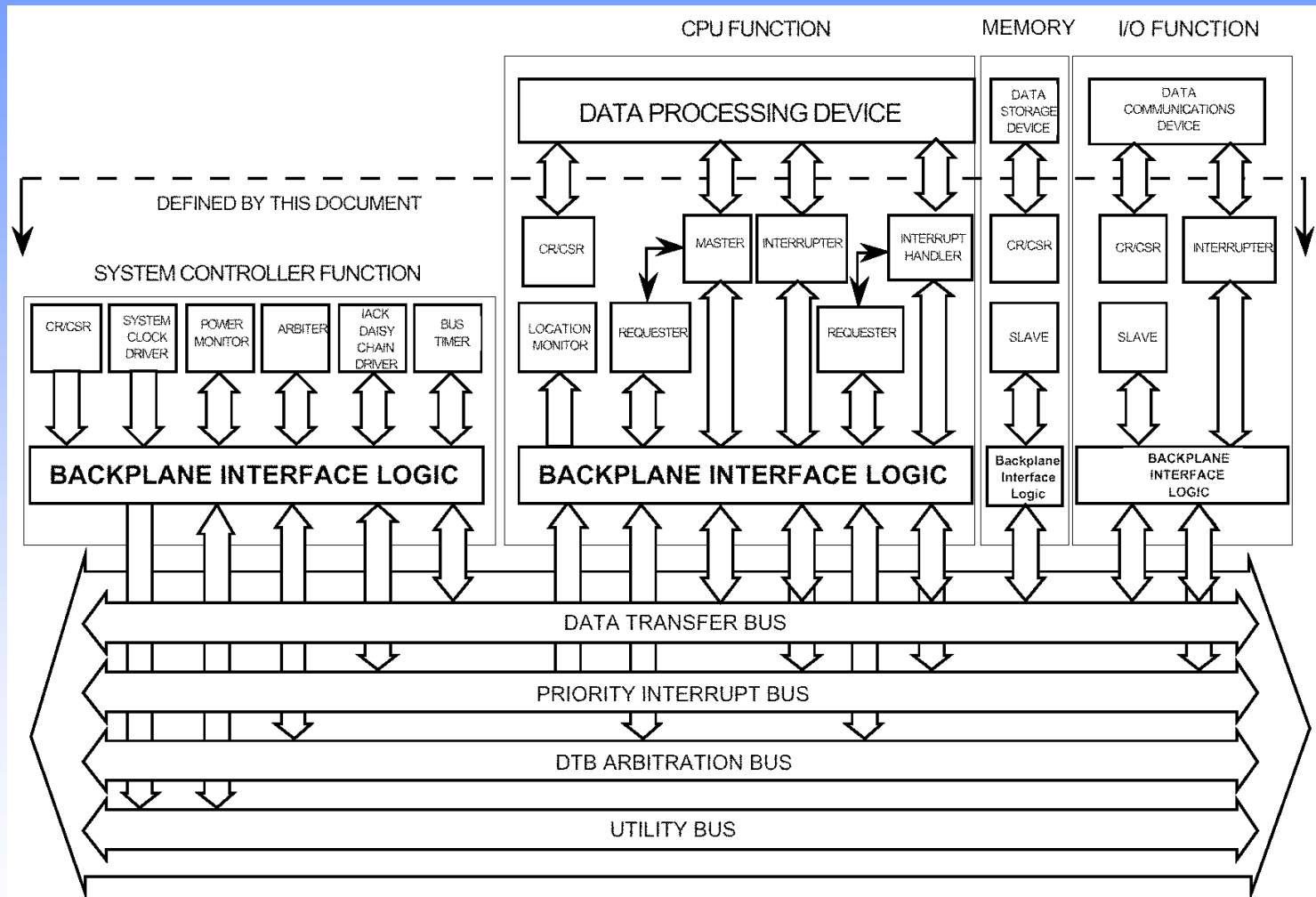
VME INTEGRATION

- **VME modules require special software drivers**

- **Similar to installing new hardware in personal computer**

- **User is responsible for installation of software driver**

- **Be aware that some VME modules do not have OS-9 drivers**

2070-1B SINGLE BOARD CPU

2070-1B CPU BLOCK DIAGRAM

68360 MICROPROCESSOR · INTERNAL BUS · MINIMUM MEMORY

TO 2070 MOTHERBOARD

6 SERIAL CHANNELS

EIA-485 BUFFERS

1 MEG X 32 DRAM

2 MEG X 16 FLASH DRIVE

256K X 16 CB SRAM

ISOLATION TRANSFORMER

10 BASE T ETHERNET

DATA KEY

GATE ARRAY

SINGLE BOARD TAKES PLACE OF TRANSITION BOARD

2070-1B CPU ETHERNET EXPANSION

- **Expansion via serial 10 Base-T Ethernet**

- **10 Mega bits per second communications rate**

- **Built-in RJ-45 connector on 2070-1B face plate**

- **Built-in Internet Protocol (IP) address for each CPU**

- **Hundreds of add-on devices from multiple vendors**

- **Commonly used with fiber splitter / Ethernet hub in cabinet**

<u>TRADITIONAL TYPE 170 CPU OPERATION</u>

- **Controller handles single application (traffic, ramp etc)**

- **Application object code located in PROM memory device**

- **Application executes directly from PROM memory device**

- **Software updated by reprogramming PROM memory device**

- **Software is developed for specific microprocessor, must be rewritten when hardware becomes obsolete**

2070 ATC CPU OPERATION

- **Operates as a general purpose computer**

- **Patterned after the IBM PC architectural model, except hardened for unattended operation in harsh environment**

- **Like a PC, multiple applications stored in FLASH drive**

- **Application software launched from drive, similar to .BAT**

- **Like a PC, software is loaded from drive to DRAM**

- **Application in DRAM accesses drive for data storage**

- **Like a PC, software is compatible with new hardware & OS**

FREEWAY MANAGEMENT EXAMPLE

- **Freeway management code is stored in FLASH drive**

- **2070 ATC boots and loads freeway mgmt code into DRAM**

- **2070 ATC continually computes volumes and occupancy**

- **In case of power fail, calculations are stored in CB SRAM**

- **Every 15 min, results are stored to file in FLASH drive**

- **File can be uploaded to central and pasted into WORD doc**

- **Other applications may reside in FLASH drive, ie RAMP**

FUTURE 2070-1C CPU

- **Next generation CPU for 2070 ATC, new CALTRANS & NEMA/AASHTO/ITE development specification**

- **Hardware and operating system independent**

- **Upon completion of Application Program Interface (API) OS-9 not required, uses any operating system**

- **Upon completion of API, 68360 not required, uses any processor meeting performance specification**

- **Performance specification for multiple application**

- **Compatible with all software developed for 2070**

2070-1C APPLICATION PROGRAM INTERFACE (API)

SOFTWARE GENERATOR →

APPLICATION SOFTWARE

↓

STANDARD API

CONTROLLER VENDOR →

↓

ANY PROCESSOR & OS